Small Business Innovation Research/Small Business Tech Transfer

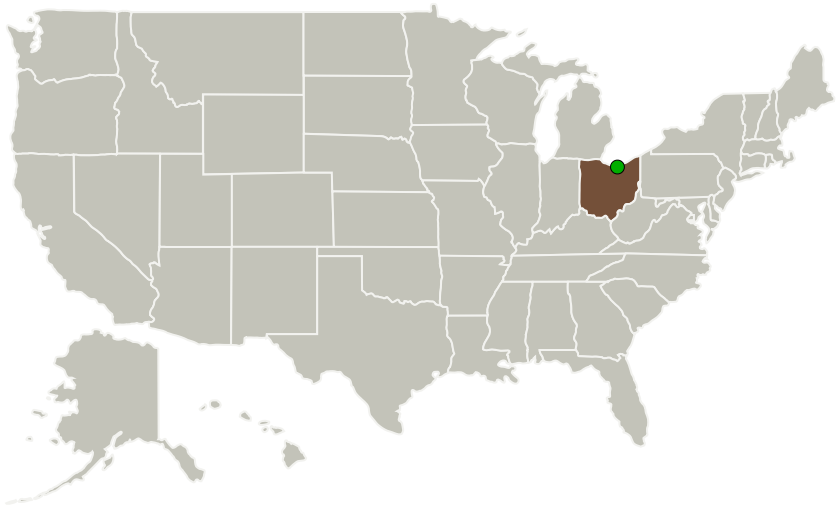
Advanced Superconducting Rotors Coils for Turboelectric Aircraft Propulsion, Phase I

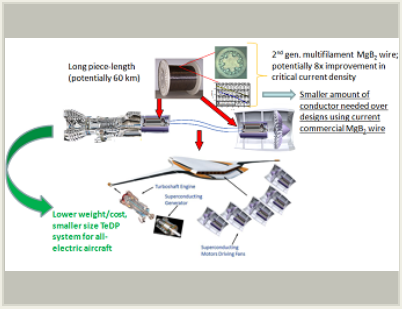
Completed Technology Project (2017 - 2017)

Project Introduction

Future Turboelectric or Hybrid Electric aircraft requires high power density and efficiency power generation components for which superconductors are likely key enablers. Therefore, there is a need for light-weight, high-performance superconducting wire with sufficiently high operating temperature, is stable, and available in long piece-length for coil fabrication. Improved 2nd generation magnesium diboride (MgB2) superconducting wires potentially provide an order-of-magnitude enhancement in current carrying capacity, and offer many advantages in materials, technological, and engineering aspects over wires based on current state-of-the-art MgB2 and all other classes of superconductors. These proposed wires will be light-weight, low-cost, and have high engineering current density, operating temperatures of 4-30K, and long piece-length, potentially up to 60 km. This proposed Phase I program focuses on: 1) developing and improving 2nd generation MgB2 multifilament wires with very high engineering current density and uniform superconductivity properties over length, and 2) developing prototype rotor coils based on these improved wires. A two-pronged approach is proposed to achieve enhanced current density and uniformity of the wire: 1) maximizing critical current by alloying and modified heat treatment approach to increase the superconducting fraction inside wires, and 2) homogenizing the MgB2 formation reaction along each sub-element in the wire by modifying conductor design, and wire fabrication and heat treatment processing parameters.

Primary U.S. Work Locations and Key Partners





Advanced Superconducting rotors Coils for Turboelectric aircraft Propulsion, Phase I Briefing Chart Image

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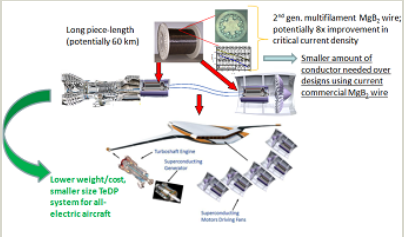
Organizations Performing Work	Role	Type	Location
Hyper Tech Research, Inc.	Lead Organization	Industry	Columbus, Ohio
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations
Ohio

Images



Briefing Chart Image
Advanced Superconducting rotors Coils for Turboelectric aircraft Propulsion, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/134942)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Hyper Tech Research, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

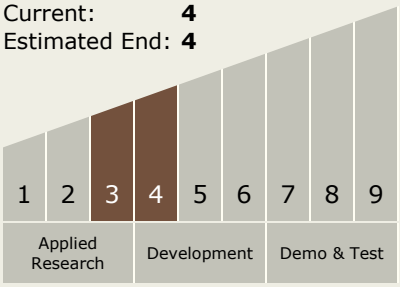
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Matthew Rindfleisch

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.9 Hybrid Electric Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System